

REMARKS

No claims are amended, no claims are canceled, and no claims are added; claims 2-4, 13, 16, 23-30 and 34-37 are withdrawn, claims 38-66 are cancelled, as a result, claims 1-37 are now pending in this application.

§112 Rejection of the Claims

Claims 1 and 31 were rejected under 35 U.S.C. § 112, first paragraph, on the grounds that the specification, while being enabling for thermal processing in the presence of a composition as described on page 16, lines 1-10, allegedly does not reasonably provide enablement for recitation of under conditions that reduce redeposition of the metal film broadly. Applicants respectfully traverse this rejection.

Applicants respectfully submit that the specification does support the broad recitation of redeposition reduction. Although the predominant material discussed in the specification is fluorine and fluorine containing compounds, the specification on page 16 states

Although the written description has illustrated the use of fluorine-containing composition is virtually all examples, it is understood that other metal-reducing compositions are used, such as the other halogens, other compositions, or combinations thereof. So long as the composition acts to preferentially combine with volatilized portions of metal ... the conditions are met that reduce redeposition...

Applicants submit that the above-quoted paragraph proves that the specification would allow one of ordinary skill in the art to understand that other materials having the proper kinetics to have an advantage over the substrate in attaching to the volatilized metal, would be a substitute for the illustrated fluorine containing compositions. Further, the use of halogens other than fluorine is discussed in the specification at least at page 4, lines 6 and 10 and at page 15, line 29. Other materials having an advantage over the substrate in attaching to volatilized metal discussed in the specification includes selective steam, either with or without fluorine, as discussed at least at page 4, line 26 and page 14, lines 2-15. Another material type discussed in the specification as having utility in the claimed arrangement is what are referred to as getters or getterers, either in solid or gaseous forms, as discussed in the specification at least at page 15, line 29.

In view of the above discussion, Applicants submit that the specification provides a broader discussion of materials and methods of reducing redeposition sufficient to enable one of ordinary skill in the art to use materials other than fluorine. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

§102 Rejection of the Claims

Claim 1 was rejected under 35 U.S.C. § 102(a) as being anticipated by Pan et al. (U.S. Patent No. 6,198,144). Applicants respectfully traverse this rejection.

The cited reference of Pan discloses a method of passivating the sidewalls of a word stack line. The passivation comprises the formation of a silicon nitride sidewall layer 22 by CVD that is formed over a CVD or sputtered oxide layer 20 (see col. 4, line 41 to col. 5, line 35) that prevents the spacer 22 from covering the entire sidewall. This is done to allow ease of oxidation of the corner of the stack to substrate intersection, as shown in Figure 5, and discussed in the cited reference starting at col. 5, line 59.

Applicants respectfully submit that the cited reference does not disclose at least the claimed feature of “*... oxidizing the patterned gate stack under conditions that reduce redeposition of the metal film on the substrate and on the gate stack of a volatilized portion of the metal film ...*”, as recited in claim 1. The Pan reference does not oxidize the patterned stack, but rather deposits dielectric layers by CVD or sputtering, and does not discuss volatilized metal films or redeposition, or preventing redeposition. The Examiner states in the outstanding Office Action on page 3 that “Pan et al discloses gate reoxidation using nitride spacers to prevent metal oxidation thus reducing redeposition as recited (abstract)”. Applicants respectfully submit that this quote unintentionally highlights one of the differences between the present invention and the cited reference, specifically that claim 1 recites *oxidizing the patterned gate stack*, whereas the cited reference discloses the oxidation of the polysilicon gate 11, and does not allow oxidation of the gate stack layers 11, 12, 13, 14 15, and 20, because of the CVD nitride layer 22.

In view of the above discussion on the differences in the structure and method of forming the structure between the claimed invention and the cited Pan reference, Applicants respectfully requests that this rejection be reconsidered and withdrawn.

§103 Rejection of the Claims

Claim 31 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Pan et al. (U.S. Patent No. 6,198,144) as applied to claim 1 above, and further in view of Jain et al. (U.S. Patent No. 6,613,682). Applicants respectfully traverse this rejection.

The cited reference of Pan has features that have been discussed above with reference to the previous rejection. The cited reference of Jain has been discussed in previous actions and includes disclosure of halogen containing gases during gate etch to remove a temporary coating of what is known in the art as a dielectric anti-reflective coating (DARC). The cited Jain reference is used in the outstanding Office Action to show that patterning of layer to form a polycide gate electrode using NF₃ gas is known.

Applicants respectfully submit that the cited Jain reference does nothing to cure the above noted failures of the cited Pan reference to describe or suggest at least the claimed feature of “...*oxidizing the polysilicon layer under conditions that reduce redeposition on the substrate and the gate stack of a volatilized portion of the metal film; and forming a spacer layer over the gate stack under conditions that reduce redeposition on the substrate and the gate stack of a volatilized portion of the metal film...*”, as recited in claim 31. Pan does not form the spacer under conditions that reduce redeposition, and does not discuss redeposition, but rather uses a CVD deposited spacer to passivation part of the gate stack sidewalls to prevent volatilization. Applicants further submit that even if the cited Pan reference did not have the above noted failures, the addition of the Jain reference does not provide any motivation to one of ordinary skill in the art to make the suggested combination. Jain is directed toward a method of removal of a dielectric layer (i.e., the DARC) while using a halogen containing etch species to etch the gate pattern, there is no motivation to look to a solution to a gate oxidation problem that is not mentioned or known to exist in the cited references. Applicant respectfully requests that the Examiner specifically explain what motivation there could be to look for a gate stack oxidation metal volatilization problem solution in a reference directed to gate etching and dielectric removal. In view of the above discussion, Applicants respectfully requests that this rejection be reconsidered and withdrawn.

Claims 1, 5, 6, 9-12, 14, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Applicant's admitted prior art (AAPA), Mitani et al. (U.S. Patent No. 6,191,463) and Pan et al. (U.S. Patent No. 6,198,144). Applicants respectfully traverse this rejection.

The cited reference of Pan has features that have been discussed above. The AAPA and the cited reference of Mitani has been discussed in previous actions. Mitani discloses a simple polysilicon gate electrode over a gate dielectric, with no description or suggestion of a gate stack having metal layers or polycide layers. The cited Mitani reference discloses exposing the polysilicon film 222 to oxygen and NF₃ at about 1 Torr pressure at about 800° C (col. 41, lines 14-16). Applicant respectfully submits that the suggested combination would result in a non-functional device since the metal layer of the AAPA would either evaporate or oxidize and destroy the device or contaminate the device. Thus, the suggested combination fails to meet the requirements of the case of *In re Gordon*, which states in general that if the proposed modification results in an arrangement that is unsatisfactory for its intended purpose, then there can be no motivation to make the proposed combination. Thus, Applicants submit that the suggested combination of references is inappropriate and still would not result in all of the claimed features of the present application. In view of the above discussion, Applicants respectfully requests that this rejection be reconsidered and withdrawn.

Claims 17 and 18-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in combination with Mitani et al. (U.S. Patent No. 6,191,463) and Pan et al. (U.S. Patent No. 6,198,144) as applied to claims 1, 5, 6, 9-12, 14, and 15 above, and further in view of Cunningham (U.S. Patent No. 6,479,362). Applicants respectfully traverse this rejection.

The features of the AAPA, Pan, and Mitani have been discussed above. The cited reference of Cunningham has been discussed in previous actions, and is used to show that it is known to form sidewalls after polycide formation. Whether or not Cunningham is an appropriate reference, Applicants submit that Cunningham does nothing to cure the above noted failures of Mitani and Pan to describe or suggest at least the claimed feature of "...thermally processing the gate stack in the presence of a fluorine-containing composition under conditions sufficient to cause the metal film more likely to combine with the fluorine-containing composition

than with the gate stack or the substrate...”, as recited in claim 18, from which claims 19-22 depend. The cited Cunningham reference with its disclosure of polysilicon sidewall and metal nitride layers does nothing to provide one of ordinary skill in the art with motivation to make the suggested combination of references. Further the suggested combination results in an arrangement that is unsatisfactory for its intended purpose, since the metal layers would evaporate under the suggested conditions.

Applicants submit that Cunningham does nothing to cure the above noted failures of Mitani and Pan to describe or suggest at least the claimed feature of “*...thermally processing the structure in the presence of a first composition such that the metal is more likely to combine with at least a portion of the first composition than with the structure...*”, as recited in claim 9, from which claim 17 directly depends. The reasoning is similar to that given above. In view of the above discussion, Applicants respectfully requests that this rejection be reconsidered and withdrawn.

Claims 31-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in combination with Mitani et al. (U.S. Patent No. 6,191,463) and Pan et al. (U.S. Patent No. 6,198,144) as applied to claims 1, 5, 6, 9-12, 14, and 15 above, and further in view of Jain et al. (U.S. Patent No. 6,613,682). Applicants respectfully traverse this rejection.

The features of the AAPA, Mitani, Pan and Jain have been discussed above. Applicants respectfully submit that the suggested combination of cited references, whether taken alone or in any combination, does not describe or suggest at least the claimed feature of “*...oxidizing the polysilicon layer under conditions that reduce redeposition on the substrate and the gate stack of a volatilized portion of the metal film; and forming a spacer layer over the gate stack under conditions that reduce redeposition on the substrate and the gate stack of a volatilized portion of the metal film...*”, as recited in claim 31. As noted above, the suggested conditions would result in evaporated metal layers and results in an arrangement that is unsatisfactory for its intended purpose, and would not work. In view of the above discussion, Applicants respectfully requests that this rejection be reconsidered and withdrawn.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney David Suhl at (508) 865-8211, or attorney Tim Clise at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

FERNANDO GONZALEZ ET AL.

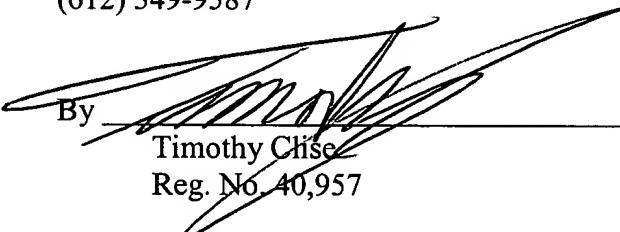
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3 Oct '05

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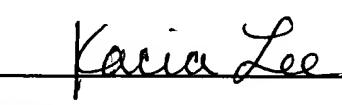

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